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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/936,629	02/07/2002	Peter Maxwell	IO-1008US	7246

24923 7590 04/19/2004

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EXAMINER	
MCCLOUD, RENATA D	

ART UNIT	PAPER NUMBER
2837	

DATE MAILED: 04/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	09/936,629	MAXWELL ET AL.	
	Examiner	Art Unit	
	Renata McCloud	2837	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-9,11-33,36 and 37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *28,31 and 32* is/are allowed.

6)☒ Claim(s) *2-9,11-27,29,30,33,36 and 37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *03/12/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to the amendment filed 03 October 2003, the following has occurred:

(a) Claims 2-5,7,8,11, 14-21, 25, 28-30, 32, and 33 have been amended.

(b) Claims 1, 10, 34, and 35 have been cancelled.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 17, 29, 30, 33, 36, and 37 are rejected under 35 U.S.C. 102(b) as being anticipated by Henrion (US 4,932,261).

Claim 17: Henrion teaches a method comprising: one or more sensor modules (Fig. 11: 80) adapted to sense seismic energy (Col. 11:23-27), wherein the sensor module comprises one or more feedback controlled accelerometers (Fig. 26: 1010,1012); recording seismic data with a seismic recorder (Fig. 26:1018); and synchronizing seismic data by receiving a signal containing time information and controlling the operation of the accelerometers and the recorders using the signals (Col. 14: 60-15:44).

Claim 29: Henrion teaches a method comprising: one or more sensor modules (Fig. 11: 80) adapted to sense seismic energy (Col. 11:23-27), wherein the sensor module comprises one or more feedback controlled accelerometers (Fig. 26: 1010,1012); recording seismic data with a seismic recorder (Fig. 26:1018); operating the accelerometer and analyzing an offset and a gravity cancellation magnitude of the output signal to detect a change in the inclination of the accelerometer (Col. 12:59-13: 18).

Claim 30: Henrion teaches a method comprising: one or more sensor modules (Fig. 11: 80) adapted to sense seismic energy (Col. 11:23-27), wherein the sensor module comprises one or more feedback controlled accelerometers (Fig. 26: 1010,1012); recording seismic data with a seismic recorder (Fig. 26:1018); operating the accelerometer and monitoring a vector sum of the coefficients of gravity of the output signals to detect a malfunction of the sensor (Col. 17: 19-18:20).

Claim 33: Henrion teaches a method comprising: one or more sensor modules (Fig. 11: 80) adapted to sense seismic energy (Col. 11:23-27), wherein the sensor module comprises one or more feedback controlled accelerometers (Fig. 26: 1010,1012); recording seismic data with a seismic recorder (Fig. 26:1018); (a) operating the accelerometers; (b) monitoring one or more of the output signals generated by the accelerometers (Col. 17: 19-35); (c) analyzing the output signals (Col. 17: 19-35); (d) changing the orientation of the sensor assembly (Col. 17: 38-55); and (e) repeating (b), (c), and (d) for a plurality of orientations Col. 17: 19-55); calculating the sensor's angles with respect to gravity from a vector sum of the coefficients of gravity

(Col. 17: 56-18: 20); and analyzing the sensor's angles with respect to gravity to indicate a malfunction of the sensor (Col. 17: 19-18:20).

Claim 36: A method of calibrating a sensor comprising determining a gravity effect on the sensor assembly for each axis (Col. 17: 19-55) and calibrating the sensor with respect to gravity (Col. 17:56-18:10).

Claim 37: A method comprising providing a sensor having a plurality of axis (Fig. 11: 80); calibrating each axis with respect to gravity (Col. 17: 56-18:10); and sensing seismic energy with the sensor (Col. 11:23-27).

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 21-27 are rejected under 35 U.S.C. 102(e) as being anticipated by Abrams et al (US 6,101,864).

Claim 21: A method comprising sensing seismic energy with one or more sensor modules (Fig. 1: 12), wherein the one or more sensor modules comprise one or more force-feedback controlled accelerometers (Col.3: 22-24, 5:27-30); recording seismic energy data using a seismic recorder (Fig. 1: 46); sending a bitstream to the sensor (Col. 5:1-7); decoding, capturing, and looping back the bitstream to the recorder

(Col. 5:38-57); capturing and analyzing the bitstream by the recorder (Col. 6: 60-67), wherein analyzing the bitstream comprises determining a malfunction of the sensor module (Col. 7:8-19).

Claim 22: using an ASIC (Col. 6: 25-27) coupled to a recorder (Fig. 1: 46).

Claim 23: A method comprising sensing seismic energy with one or more sensor modules (Fig. 1: 12), wherein the one or more sensor modules comprise one or more force-feedback controlled accelerometers (Col.3: 22-24, 5:27-30); recording seismic energy data using a seismic recorder (Fig. 1: 46); sending a bitstream to the sensor (Col. 5:1-7); decoding, capturing, and looping back the bitstream to the recorder (Col. 5:38-57); capturing and analyzing the bitstream by the recorder (Col. 6: 60-67), wherein analyzing the bitstream comprises determining a malfunction of the sensor module (Col. 7:8-19); using an ASIC (Col. 6: 25-27) coupled to a recorder (Fig. 1: 46); and validating the contents of the ASIC (Col. 6: 36-45).

Claim 24: operating the accelerometer (Col. 13: 48-65) and monitoring the accelerometer for instability to indicate a malfunction or and excessive external acceleration (Col. 13; 65-14: 10).

Claim 25: A method comprising sensing seismic energy with one or more sensor modules (Fig. 1: 12), wherein the one or more sensor modules comprise one or more force-feedback controlled accelerometers (Col.3: 22-24, 5:27-30); recording seismic energy data using a seismic recorder (Fig. 1: 46); sending a bitstream to the sensor (Col. 5:1-7); capturing and judging the bitstream generated by the accelerometer (Col.

6: 60-67; Coo. 13:), wherein judging the output signal comprises judging a magnitude of the output signal to indicate a malfunction of the accelerometer (Col. 2: 63-3: 15).

Claim 26: judging the output signal comprises judging a phase response of the output signal to indicate a malfunction of the accelerometer (Col. 7: 48-61).

Claim 27: A method comprising sensing seismic energy with one or more sensor modules (Fig. 1: 12), wherein the one or more sensor modules comprise one or more force-feedback controlled accelerometers (Col.3: 22-24, 5:27-30); recording seismic energy data using a seismic recorder (Fig. 1: 46); sending a bitstream to the sensor (Col. 5:1-7); capturing, analyzing, and judging the bitstream generated by the accelerometer (Col. 6: 60-67; Coo. 13:), wherein judging the output signal comprises judging a harmonic distortion of the output signal to indicate a malfunction of the accelerometer (Col. 5:66-6:7).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 2-7, 11, 12, 15, 16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Henrion (US 4,932,261) in view of Tanenhaus et al (US 6,255,962).

Claims 4 and 11: Henrion teaches an apparatus and method comprising: one or more sensor modules (Fig. 11: 80) adapted to sense seismic energy (Col. 11:23-27), wherein the sensor module comprises one or more accelerometers (Fig. 26: 1010,1012), and wherein the accelerometers have one or more axes of sensitivity (e.g. Fig. 26:Ax,Ay); one or more seismic recorders (Fig. 26:1018) coupled to the sensor module adapted to record seismic data indicative of seismic energy (Col. 20:65-21:1), and a feedback control circuit (Fig. 13:130) adapted to provide force-balanced feedback (Col. 12: 58-68) coupled to the sensors and for providing insensitivity to tilt (Col. 13:44-51). Henrion does not teach a controller to monitor operation of the apparatus coupled to the sensor. Tanenhaus et al teach a controller (Fig. 1: 20) to monitor operation of the apparatus coupled to the sensor (Col. 5:10-20). It would have been obvious to one having ordinary skill in the art at the time that the invention was made to modify the apparatus taught by Henrion to include a controller as taught by Tanenhaus et. The advantage of this would be the ability to process the sensed signals.

Claim 2: Henrion and Tanenhaus et al teach the limitations of claim 4. Referring to claim 2, Henrion teaches the sensor modules comprise one or more micro-machined sensor elements (Col. 7: 40-42).

Claim 3: Henrion and Tanenhaus et al teach the limitations of claim 4. Referring to claim 3, Tanenhaus et al the sensor module further comprises a global positioning

system receiver (e.g. Fig. 1:67) adapted to synchronize and operation of the sensors to a common time (Col. 8: 51-60).

Claim 5: Henrion and Tanenhaus et al teach the limitations of claim 4. Referring to claim 5, Tanenhaus et al teach a controller coupled to the sensor module for controlling the operation of the apparatus (e.g. Fig. 1:26); wherein the sensor module comprises a 3-axis magnetometer for determining the orientation of the sensor module (e.g. Col. 4:24-28).

Claim 7: Henrion and Tanenhaus et al teach the limitations of claim 4. Referring to claim 7, Tanenhaus et al teach the sensor module provides a digital output signal (e.g. Fig. 1:22).

Claim 12: Henrion and Tanenhaus et al teach the limitations of claim 11. Referring to claim 12, Henrion teaches determining a tilt angle of the sensor and measuring the gravity field (Col. 17: 18-64).

Claim 15: Henrion and Tanenhaus et al teach the limitations of claim 11. Referring to claim 15, Tanenhaus et al teach synchronizing the operation of a seismic sensor module by using a global positioning system signal from a global positioning system receiver within the sensor module (e.g. Fig. 1:67).

Claim 16: Henrion and Tanenhaus et al teach the limitations of claim 11. Referring to claim 16, Tanenhaus et al teach determining the position of the seismic sensor by using a global positioning system signal from a global positioning system receiver within the sensor module (e.g. Col. 29-41).

Claim 18: Henrion and Tanenhaus et al teach the limitations of claim 11. Referring to claim 18, Tanenhaus et al teach determining the degree of coupling between the sensor module and the ground by generating a force (Col. 5:58-64); recording a response of the sensor assembly to the force; and analyzing the response (e.g. Col. 5:65-6:7).

Claim 6: Henrion teaches an apparatus comprising: one or more sensor modules adapted to sense seismic energy (Fig. 11: 80), wherein the sensor module comprises one or more accelerometers (Fig. 26: 1010,1012), and wherein the accelerometers have one or more axes of sensitivity (Fig. 26:Ax,Ay); one or more seismic recorders (Fig. 26:1018) coupled to the sensor module adapted to record seismic data indicative of seismic energy (Col. 20:65-21:1), a crystal assembly (Fig. 1:10) coupled to the sensor module (Fig. 9B: 80) for providing a force (Col. 11: 46-59) in order to measure the ground coupling and vector fidelity of the sensor (Col. 20:45-60). Henrion does not teach a controller to monitor operation of the apparatus coupled to the sensor. Tanenhaus et al teach a controller (Fig. 1: 20) to monitor operation of the apparatus coupled to the sensor (Col. 5:10-20). It would have been obvious to one having ordinary skill in the art at the time that the invention was made to modify the apparatus taught by Henrion to include a controller as taught by Tanenhaus et. The advantage of this would be the ability to process the sensed signals.

(Col. 9: 10-25). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the seismic data acquisition apparatus

taught by Tanenhaus et al to include a crystal assembly as taught by Paik. The advantage of this would be the precise axis alignment of the sensor.

8. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Henrion and Tanenhaus et al as applied to claim 4 above, in view of Ambs (U.S. Patent 6,028,817).

Claim 8: Henrion and Tanenhaus et al teach the limitations of claim 4. Referring to claim 8, Tanenhaus et al teach one seismic recorder (e.g. Fig. 7:10"'). They do not teach the recorder being radio recorders. Ambs teaches the one or more seismic recorders are radio seismic recorders (e.g. Col. 2:14-25). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the seismic data acquisition apparatus taught by Henrion and Tanenhaus et al to make the seismic recorders radio seismic recorders as taught by Ambs. The advantage of this would be the ability to send seismic data to a remote location.

Claim 9: Henrion, Tanenhaus et al, and Ambs teach the limitations of claim 8. Tanenhaus et al, Harrell et al, and Ambs teach the limitations of claim 9 except for the radio seismic recorders being integral to the sensor modules. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the seismic data acquisition apparatus taught by Tanenhaus et al, Harrell et al, and Ambs to make the radio seismic recorders integral to the sensor modules, since it has been held that forming in an article which has formerly been formed in two pieces

and put together involves only routine skill in the art. *Howard v. Detroit Stove Works*, 150 U.S. 164 (1893).

9. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanenhaus et al and Harrell et al as applied to claim 4 above, in view of Spangler et al (US 5,433,101).

Claim 13: Tanenhaus et al and Harrell et al teach the limitations of claim 11. Referring to claim 13, they do not teach calibrating the sensor, storing tilt info within the sensor, and measuring the gravity effect on the sensor module. Spangler et al teach calibrating the sensor, storing tilt info within the sensor (Col. 6: 22-42), and measuring the gravity effect on the sensor module (Col. 4: 28-34). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the seismic data acquisition apparatus taught by Tanenhaus et al and Harrell et al to measure the tilt and gravity field as taught by Spangler et al. The advantage of this would be the ability to sense system failures.

10. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Henrion and Tanenhaus et al as applied to claim 11 above, and further in view of Stephen (US 6,430,105).

Claim 14: Henrion and Tanenhaus et al teach the limitations of claim 11. Referring to claim 14, Henrion teaches a 3-axis sensor (Fig. 20C: x,y, z), determining the orientation of the 3-axis sensor by: performing a 3-D measurement of a gravity field

(Col. 17: 19-55); determining a gravity vector (Col. 17: 19-55). They do not teach performing a 3-D measurement of the magnetic field; determining a magnetic vector and determining the direction of magnetic north and gravity down. Stephen teaches a 3-axis sensor (Fig. 2a: 1; Col. 4: 8-14), determining the orientation of the 3-axis sensor by: performing a 3-D measurement of a gravity field (Col. 4: 15-21); determining a gravity vector (Col. 4: 41-46); performing a 3-D measurement of the magnetic field (Col. 5: 9-12); determining a magnetic vector (Col. 5: 12-16) and determining the direction of magnetic north and gravity down (Col. 5: 9-19, 33-37).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the seismic data acquisition apparatus taught by Tanenhaus et al, and Harrell et al, to use a 3-axis sensor as taught by Stephen. The advantage of this would be improved accuracy of survey.

11. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Henrion and Tanenhaus et al as applied to claim 11 above, in view of Orban et al (WO 98/14800).

Claim 19: Henrion and Tanenhaus et al teach the limitations of claim 11. Referring to claim 19, they do not teach determining a vector of the sensor module by generating a force; recording a response of the sensor assembly to the force; and analyzing the response. Orban et al teach determining a vector of the sensor module by generating a force; recording a response of the sensor assembly to the force; and analyzing the response (e.g. Col. 2:57-65).

Claim 20: Henrion and Tanenhaus et al teach the limitations of claim 11. Referring to claim 20, they do not teach determining the orientation of the sensor module by generating a force at a plurality of source points; recording a response of the sensor module to the force; and analyzing the response. Orban et al teach determining the orientation of the sensor module by generating a force at a plurality of source points; recording a response of the sensor module to the force; and analyzing the response (e.g. Col. 2:57-65).

It would have been obvious to one having ordinary skill in the art at the invention was made to modify the seismic data acquiring method taught by Henrion and Tanenhaus et al to include the teaching of Orban et al. The advantage of this would a method of acquiring seismic data with that allows proper acoustic coupling of sensors to the ground.

Allowable Subject Matter

12. Claims 28, 31, and 32 are allowed.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. They are: Paik (US 4,841,772), Dailey (US 5,160,925), White (US 5,060,504), Ferriss (US 3,877,313), Harrell et al (US 5,842,149), and Tyburski (US 4,912,471).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renata McCloud whose telephone number is (571) 272-2069. The examiner can normally be reached on Mon.- Fri. from 8 am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Nappi can be reached on (571) 272-2800 ext. 37. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Renata McCloud
Examiner
Art Unit 2837

RDM

RINA DUDA
PRIMARY EXAMINER